What is claimed is:

- 1 1. An apparatus for avoiding vehicle
- 2 collisions comprising:
- a forward-looking sensor generating a forward-
- 4 looking signal corresponding to the relative
- 5 positions between a host vehicle and a target object;
- a yaw rate sensor generating a yaw rate signal
- 7 corresponding to the angular position of said host
- 8 vehicle relative to said target object; and
- 9 a controller electrically coupled to said
- 10 forward-looking sensor and said yaw rate sensor, said
- 11 controller receiving said forward-looking signal and
- 12 said yaw rate signal, said controller including
- 13 control logic operative to predict the probability
- 14 density function for the position of a vehicle at
- 15 several future occasions, predict the probability
- 16 density function for the position of said additional
- 17 object at several future occasions, form the joint
- 18 probability density function for the relative
- 19 positions of the vehicle and object at said several
- 20 future occasions, and integrate the joint probability
- 21 density function over the area in which the vehicle
- 22 and the object are in physical conflict based upon
- 23 said forward-looking signal and said yaw rate signal.
 - 1 2. The apparatus as recited in claim 1,
 - 2 wherein said target object is a vehicle.
 - 1 3. The apparatus as recited in claim 1,
 - 2 wherein said object is a fixed object.

- 1 4. The apparatus as recited in claim 1,
- 2 wherein the probability density function is predicted
- 3 for several vehicles, fixed objects and moving
- 4 objects.
- 1 5. The apparatus as recited in claim 1,
- 2 wherein said forward-looking signal corresponds to
- 3 the total width and length of the vehicle and the
- 4 object.
- 1 6. The apparatus as recited in claim 1,
- 2 wherein said probability density function is
- 3 approximated with the Gaussian normal distribution.
- 1 7. The apparatus as recited in claim 1,
- 2 wherein the probability density function is
- 3 calculated using the Kalman filter.
- 1 8. The apparatus as recited in claim 7,
- 2 wherein the Kalman filter is used to calculate the
- 3 covariance matrix of the vehicle and the object.
- 1 9. The apparatus as recited in claim 1,
- 2 wherein the method also comprises the step of taking
- 3 a suitable cause of action for the specific
- 4 situation.
- 1 10. A method for avoiding vehicle collisions
- 2 comprising the steps of:

- 3 generating a forward-looking signal
- 4 corresponding to the relative positions between a
- 5 host vehicle and a target object;
- 6 generating a yaw rate signal corresponding to
- 7 the angular position of said host vehicle relative to
- 8 said target object;
- 9 predicting the probability density function for
- 10 the position of a vehicle at several future
- 11 occasions;
- 12 predicting the probability density function for
- 13 the position of said additional object at several
- 14 future occasions;
- forming the joint probability density function
- 16 for the relative positions of the vehicle and object
- 17 at said several future occasions; and
- 18 integrating the joint probability density
- 19 function over the area in which the vehicle and the
- 20 object are in physical conflict based upon said
- 21 forward-looking signal and said yaw rate signal.
 - 1 11. The method as recited in claim 1, wherein
 - 2 said target object is a vehicle.
 - 1 12. The method as recited in claim 1, wherein
 - 2 said object is a fixed object.
 - 1 13. The method as recited in claim 1, wherein
 - 2 the probability density function is predicted for
 - 3 several vehicles, fixed objects and moving objects.

- 1 14. The method as recited in claim 1, wherein
- 2 said forward-looking signal corresponds to the total
- 3 width and length of the vehicle and the object.
- 1 15. The method as recited in claim 1, wherein
- 2 said probability density function is approximated
- 3 with the Gaussian normal distribution.
- 1 16. The method as recited in claim 1, wherein
- 2 the probability density function is calculated using
- 3 the Kalman filter.
- 1 17. The method as recited in claim 7, wherein
- 2 the Kalman filter is used to calculate the covariance
- 3 matrix of the vehicle and the object.
- 1 18. The method as recited in claim 1, wherein
- 2 the method also comprises the step of taking a
- 3 suitable cause of action for the specific situation..